



VMQ Series

VMQ-4 / VMQ-2D / VMQ-SDI

1U Monitor Speaker Unit with 4 Analog Inputs
or 2 AES/EBU Inputs or 1 SDI Input, with
4 Analog Outputs, 4 Separate Volume Controls
w/mutes, and 4 Signal Indication LEDs

Document P/N 821504 Rev-D

User Manual

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Important Safety Instructions

- 1) Read these instructions.
- 2) Keep these instructions.
- 3) Heed all warnings.
- 4) Follow all instructions.
- 5) Do not use this apparatus near water.
- 6) Clean only with dry cloth.
- 7) Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
- 8) Do not install near any heat source such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
- 9) Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
- 10) Protect the power cord from being walked on or pinched, particularly at plugs convenience receptacles and the point where they exit from the apparatus.
- 11) Only use attachments/accessories specified by the manufacturer.
- 12) Use only with the cart stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
- 13) Unplug this apparatus during lightning storms or when unused for long periods of time.
- 14) Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as when power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
- 15) Do not expose this apparatus to rain or moisture.
- 16) The apparatus shall be connected to a mains socket outlet with a protective earthing connection.

CAUTION!



In products featuring an audio amplifier and speakers, the surface at the side of the unit, where the audio amplifier heat sink is internally attached, may get very hot after extended operation. When operating the unit exercise caution when touching this surface and ensure that external materials which may be adversely affected by heat are not in contact with it. There is a Hot Surface label (see diagram) attached to the aforementioned surface of the product.

Introduction

Congratulations on your selection of a Wohler Technologies **VMQ Series** audio monitor unit. We are confident it represents the best performance and value available, and we guarantee your satisfaction with it.

If you have questions or comments you may contact us at:

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Section 1

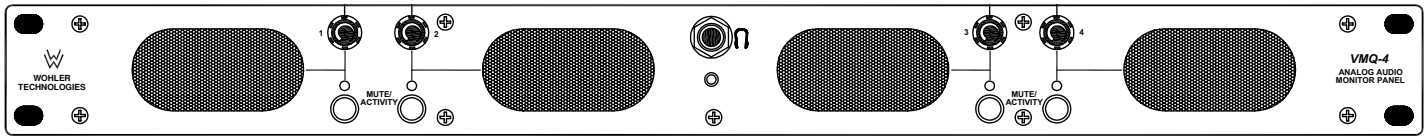
General Features and Specifications

**Description
Features
Applications
Specifications
Rear Panel Configurations**

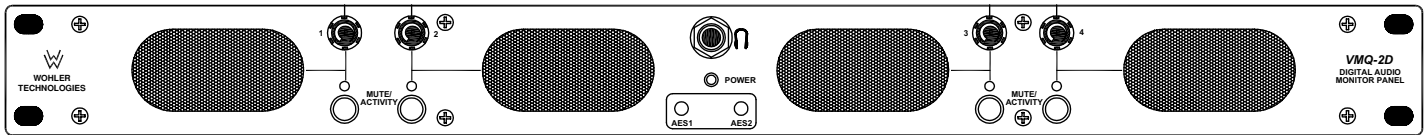


VMQ Series

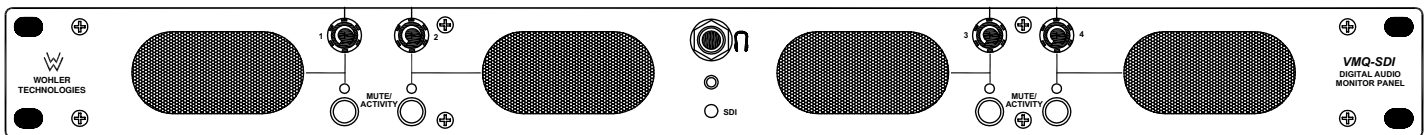
Four-Channel Audio Monitoring Units



VMQ-4 Front Panel



VMQ-2D Front Panel



VMQ-SDI Front Panel

Description

The single-rackspace VMQ series from Wohler Technologies permits simultaneous monitoring of up to four audio sources with “voice quality” fidelity.

Because each channel has its own dedicated power amplifier and speaker, the audio sources remain completely separate from analog input to output. When listening within “Ultra Near Field” distances of 1 to 3 feet, these discrete speaker outputs provide enhanced source distinction when compared to designs with four inputs mixed into a single output.

Three models are available; the VMQ-4, which accepts four standard analog inputs, the VMQ-2D, which accepts two AES/EBU inputs (two sub-channels each), and the VMQ-SDI, which accepts one SDI input (four sub-channels).

A separate volume control is provided for each of the four monitored channels. Also, each channel has an LED, which illuminates when a signal is “active” in that channel. This allows the operator to easily determine which VMQ-4 channels are currently active, and is very helpful when quick volume adjustments are required. Separate mute buttons are provided for each channel. These together with an LED that indicates channel muting allows the operator to instantly mute one or more channels and determine, at a glance which channels are muted.

A stereo headphone jack has channels 1 and 2 summed on the left side, and channels 3 and 4 on the right side.

The VMQ series is fully magnetically shielded to allow operation immediately adjacent to all CRT video monitors. Its light weight and shallow-depth chassis make it ideal for use in portable and mobile vehicle applications.

Features

- Only ONE rack space high.
- Monitoring of four discrete audio channels in one unit.
- Three models available:
 - VMQ-4 with four analog inputs
 - VMQ-2D with two AES/EBU inputs
 - VMQ-SDI with one SDI input
- Dedicated input circuitry for each output channel.
- Volume control for each of four channels.
- Fully magnetically shielded.
- Signal present LED on each channel output.
- Digital signal light for AES/EBU and SDI models
- Mute button and LED for each channel.
- Headphone jack

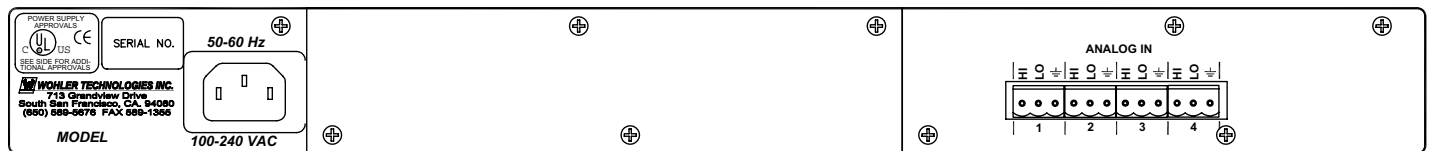
Applications

- Monitoring multiple incoming feeds for news /talk shows
- Confidence/cueing monitoring for D2- , D3- and D5-type VTRs in machine rooms and edit bays
- Monitoring of multiple inputs in TV newsrooms
- Monitoring multiple audio feeds in theme parks, security installations, and teleconferencing systems

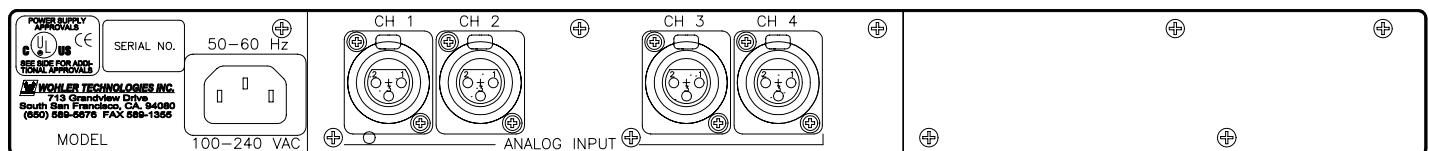
Specifications

Input impedance:	Greater than: 100 k Ω (Ohm) balanced 50 k Ω (Ohm) unbalanced	Magnetic shielding:	Less than 0.2 Gauss any adjacent surface
Input level for full output: (volume full on)	0 dBv balanced. -12dBv unbalanced Other sensitivity ranges available on request	Connectors:	Balanced: Phoenix (Standard) or XLR (Optional)
Hum and noise:	Better than -70 dB below full output	Dimensions (HxWxD):	1.75 x 19 x 9.7 in. 44.5 x 483 x 246 mm.
Frequency response:	300 Hz to 16 kHz ($\pm$ 9dB)	Weight:	7 lbs. (3.2 kg)
Maximum acoustic output:	94 dB SPL at 2 feet	Power Supply:	Universal AC input (100-240V) UL/CSA approved
Electrical distortion:	Less than 0.2% at any level below limiting threshold	Power consumption:	20W / 35W (avg. / max)

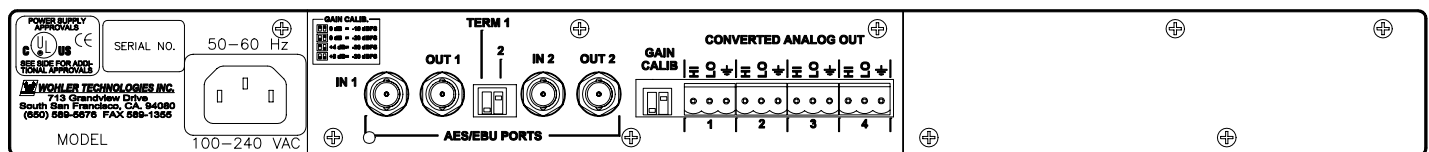
Rear Panel Configurations



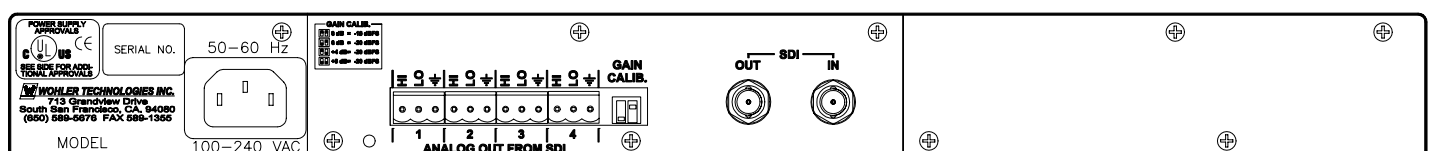
VMQ-4 Rear Panel



VMQ-4/X Rear Panel (With XLR Connectors)



VMQ-2D Rear Panel



VMQ-SDI Rear Panel

Units are certified to meet, at time of manufacture, all currently applicable product safety and EMC requirements, such as those of UL and CE. 0 dBv ref. 0.775V RMS. Features and specifications subject to improvement without notice.

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Section 2

Operation

Installation

Front Panel Features

Rear Panel Features

Installation

Mounting

The unit should be mounted where convenient for operating persons, ideally at approximately ear level for best high frequency response. Its superior magnetic shielding eliminates concerns about locating it adjacent to most types of CRT monitors, including even high-resolution color monitors.

Heat Dissipation

Heat dissipated by the speaker amps is conducted directly to the sides of the chassis; no special considerations for cooling are necessary as long as the ambient temperature inside the rack area does not exceed approximately 40°C (104°F).

Sympathetic Vibration

Sympathetic vibration from other equipment (cables, etc.), in the rack may be serious enough to interfere with the unit's sound quality out in the listening area. The use of thin card stock and/or felt or foam weather-stripping type materials between adjacent vibrating surfaces, or tying up loose cables, etc., may be required to stop vibrations external to the unit.

Mechanical Bracing

The chassis is securely attached to the front panel at eight points along its surface, not just at the four corners of the chassis ears. This feature will reduce or eliminate rear bracing requirements in many mobile/portable applications. The weight of internal components is distributed fairly evenly around the unit.

Electrical Interference

As with any audio equipment, maximum immunity from electrical interference requires the use of shielded cable; however, satisfactory results can sometimes be obtained without it. The internal circuitry common is connected to the chassis. In the VMQ-4 (standard analog inputs), unbalanced sources may also be applied to the balanced inputs. For analog input signals, the gain is 6 dB greater with a single-ended source connected across both "hot" terminals than when connected between either input and common. Note that the unused input terminal of a balanced input should be connected to common, rather than being left floating, to insure best immunity to noise.

AC Power

The unit's AC mains connection is via a standard IEC inlet, with safety ground connected directly to the unit's chassis. The universal AC input (100-240VAC, 50/60Hz) switching power supply is a self-resetting sealed type, with automatic over-voltage and over-current shutdown. There is no user-replaceable fuse in either the primary or secondary circuit.

Magnetic Shielding

We have defined five levels of magnetic shielding. Level One represents the most minimal shielding of the steel chassis compared to the stray field of the speakers without any ferro-magnetic enclosure. Level One typically results in a field strength of two Gauss at a distance of two inches from the enclosure surface. (Because of the inverse square law, such a field is eight Gauss at one inch from the surface!) Because of the purity of color of the CRT display, it is extraordinarily sensitive to magnetic fields making Level One shielding inadequate, even if the CRT is several rackspaces away. (CRT color purity may be disturbed by fields as low as 1/2 Gauss.) Level Two shielding, specified as two Gauss or less anywhere along the top and bottom surfaces and front panel, was an interim level, and is sometimes the best available for highly customized units, but is satisfactory in many applications.

Installation

Magnetic Shielding (Cont.)

The VMQ series employs proprietary methods to achieve Level Three shielding, which is specified as one to 1.5 Gauss or less at the surface, anywhere along the top or bottom of the chassis and front panel. (The VMQ has stray field of about 1 Gauss.) For all situations we are aware of, this level has proved to be entirely satisfactory. With Level Three shielding, the unit may be located in the rackspace immediately above, below or to either side of a color monitor, usually without disturbing the purity at all.

Audio Connections

Connection of the audio feeds is straightforward. The system block diagrams located on pages 17, 18 and 19 may be referred to for clarification of the general signal paths into and out of the VMQ units.

Please note the following:

- 1) The internal circuitry common is connected to the chassis.
- 2) If RCA phono inputs (unbalanced) were ordered for the VMQ-4 unit, they have approximately 12dB more gain than the XLR (balanced) connectors for use with equipment which has "consumer" line level outputs (-10 to -15 dBv). Higher level unbalanced sources may be applied to the balanced inputs for increased headroom. The gain is approximately 4dB greater with a single-ended source connected across both "hot" terminals than when connected between either input and common.

NOTE: Unless otherwise noted, all chassis mounted XLR and BNC connectors are female.

Front Panel Features

Please refer to Figure-2a on the following page to familiarize yourself with the front panel features of the three VMQ models. The following sections describe these features and are referenced, by number, to Figure-2a.

1 **Internal Speakers (4 places)**

The VMQ internal speaker system is comprised of four separate mid-range speakers. From left to right the speakers correspond to channels 1 through 4; one speaker for each of the four channels.

2 **Volume Controls (4 places) - Rotary Pots**

Each volume control adjusts the loudness of the audio reproduced by the associated internal speakers of the respective channel (or connected headphone). From left to right the volume controls correspond to channels 1 through 4.

3 **Headphone Jack - 1/4" Phone Plug**

For critical listening or for listening in high noise environments, use the headphone feature rather than the internal speakers. When being monitored by headphones, channels 1 and 2 are summed to the left headphone while channels 3 and 4 are summed to the right. When you plug in headphones, the speakers will mute. This jack accepts the standard 1/4" phone type stereo plug.

4 **Channel Mute Indication (4 places) - Red LED**

There is a Channel Mute Indicator LED for each of four channels and each LED will glow red to indicate the mute feature is being used on the associated channel. From left to right the Channel Mute buttons correspond to channels 1 through 4.

5 **Mute Button / Channel Activity Indication (4 places) - Push Button/ Amber LED**

Mute Button: There is a Mute Button for each of four channels. When depressed, these buttons toggle the mute feature on and off for the associated channel. When a channel is muted, the LED above the associated button will glow red (Item 4, above).

Channel Activity Indicator: Signal activity in any given channel will cause the LED in the associated button for that channel to glow amber.

6 **Power Indication - Green LED**

The Power Indicator LED signals the operating condition of the power supply. The LED glows green to indicate the VMQ-4 is connected to mains power and an operation voltage is present.

7 **AES/EBU Signal Indication - Red/Green Bi-color LED (VMQ-2D Only)**

These two LEDs each glow green to indicate the presence of valid AES/EBU signals (one for each of two inputs) and each will glow red to indicate the absence of such signals in the associated input.

8 **SDI Indication - Red/Green Bi-color LED (VMQ-SDI Only)**

This LED glows green to indicate the presence of a valid SDI signal and will glow red to indicate possible errors in the SDI signal. If there is no SDI signal, the LED will be unlit.

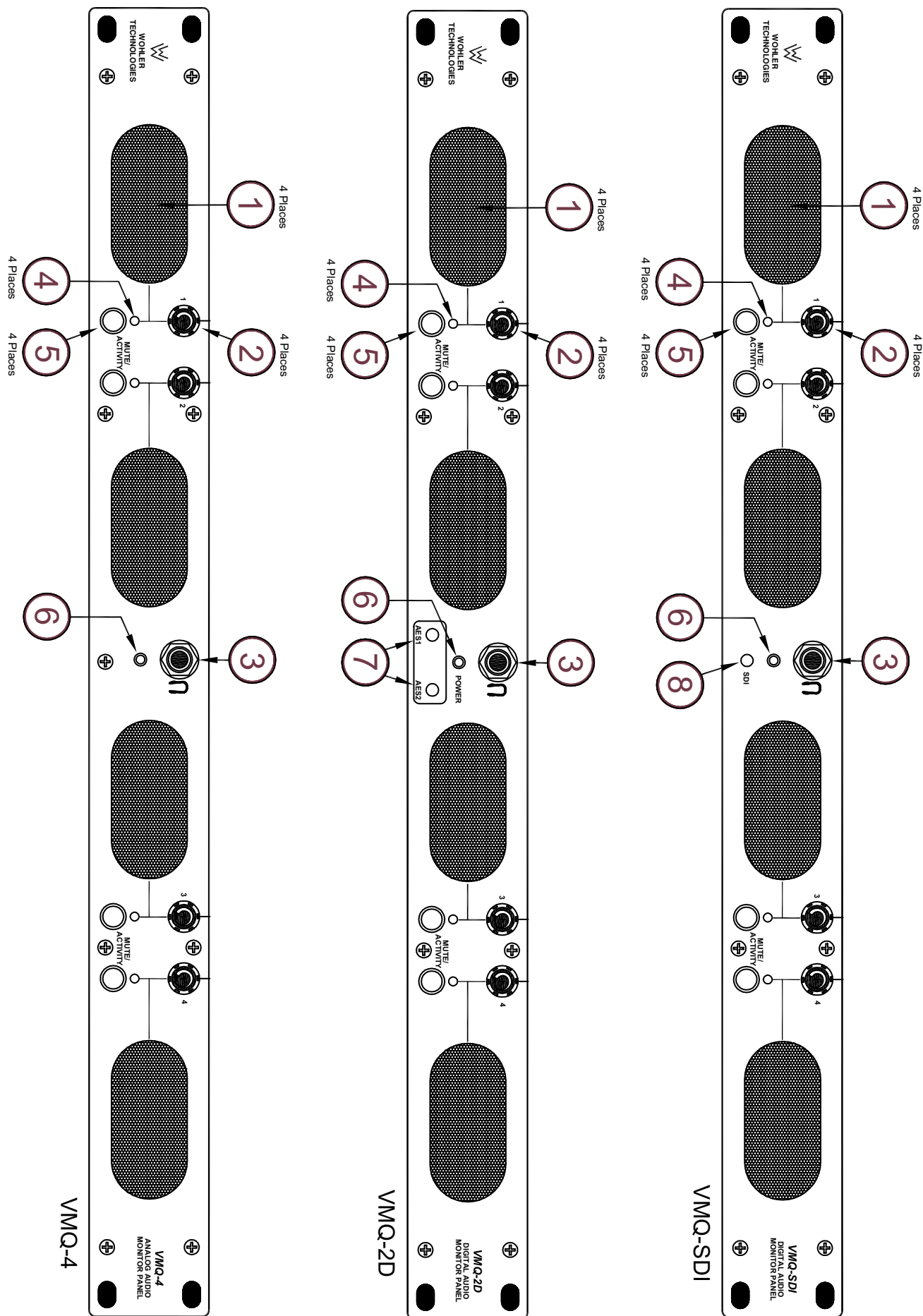


Figure-2a: VMQ Series Front Panel Features

Rear Panel Features

Please refer to Figure-2b on the following page to familiarize yourself with the rear panel features of the three VMQ models. The following sections describe these features and are referenced, by letter, to Figure-2b.

A Power Input - IEC-320 Connector

Attach a standard IEC-320 power cord between this connector and mains power (100 - 250VAC, 50/60 Hz). The front panel power LED (Item 6, page 10) will glow green to indicate operating voltages are present.

B Analog Inputs - Chan. 1-4 - Phoenix or XLR Connector (VMQ-4)

These four inputs are meant to receive standard analog audio signals and are configured for balanced (100K Ohm) connections. Either Phoenix (standard) or XLR (optional) connectors may be specified at the time of ordering the VMQ-4. Inputs are labeled 1 through 4. XLR connectors are 3-pin female and Phoenix Connectors are standard 3-pin type. Pin-out information for Phoenix connectors are silk-screened above each connector. XLR pin-outs are as follows: Pin-1 = common, Pin-2 = low, Pin-3 = high.

C AES/EBU Inputs and Outputs - Chan. 1-2 - BNC Connector (VMQ-2D)

The two BNC connector inputs (IN 1 and IN 2) are meant to receive standard AES/EBU digital audio signals. There are also two re-clocked outputs (OUT 1 and OUT 2) derived from the two inputs. All BNC connectors are female.

D SDI Input and Output - BNC Connector (VMQ-SDI)

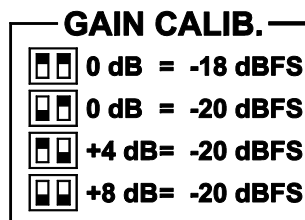
The SDI input connector is meant to receive a standard SDI digital audio signal. The output is derived from the input signal and is re-clocked. Both BNC connectors are females.

E Termination Select - 2-Position DIP Switch (VMQ-2D)

This DIP switch sets the termination characteristics of the AES/EBU input connectors. There are two switches; one on the left (TERM 1) for the Channel 1 input/output, and one on the right (TERM 2) for the Channel 2 input/output. In the event that signals entering a channel input are connected to terminated downstream equipment via the OUT connectors (or external "T" connectors), the DIP switch associated with that channel should be set to unterminated (UP). If there is no connection to downstream equipment, then the DIP switch should be set to terminated (DOWN).

F Gain Calibration - 2-Position DIP Switch (VMQ-2D and VMQ-SDI)

Gain calibration, the analog level which corresponds to a given digital value, is settable via this DIP switch. The factory setting is +4 dB = -20 dBFS. See below or the silk-screen on the rear panel for settings.



G Converted Analog Out - Phoenix Connector (VMQ-2D)

These connectors output a converted analog signal of the four channels derived from the AES/EBU inputs.

H Analog Out From SDI - Phoenix Connector (VMQ-SDI)

These connectors output a converted analog signal of the four channels derived from the SDI input.

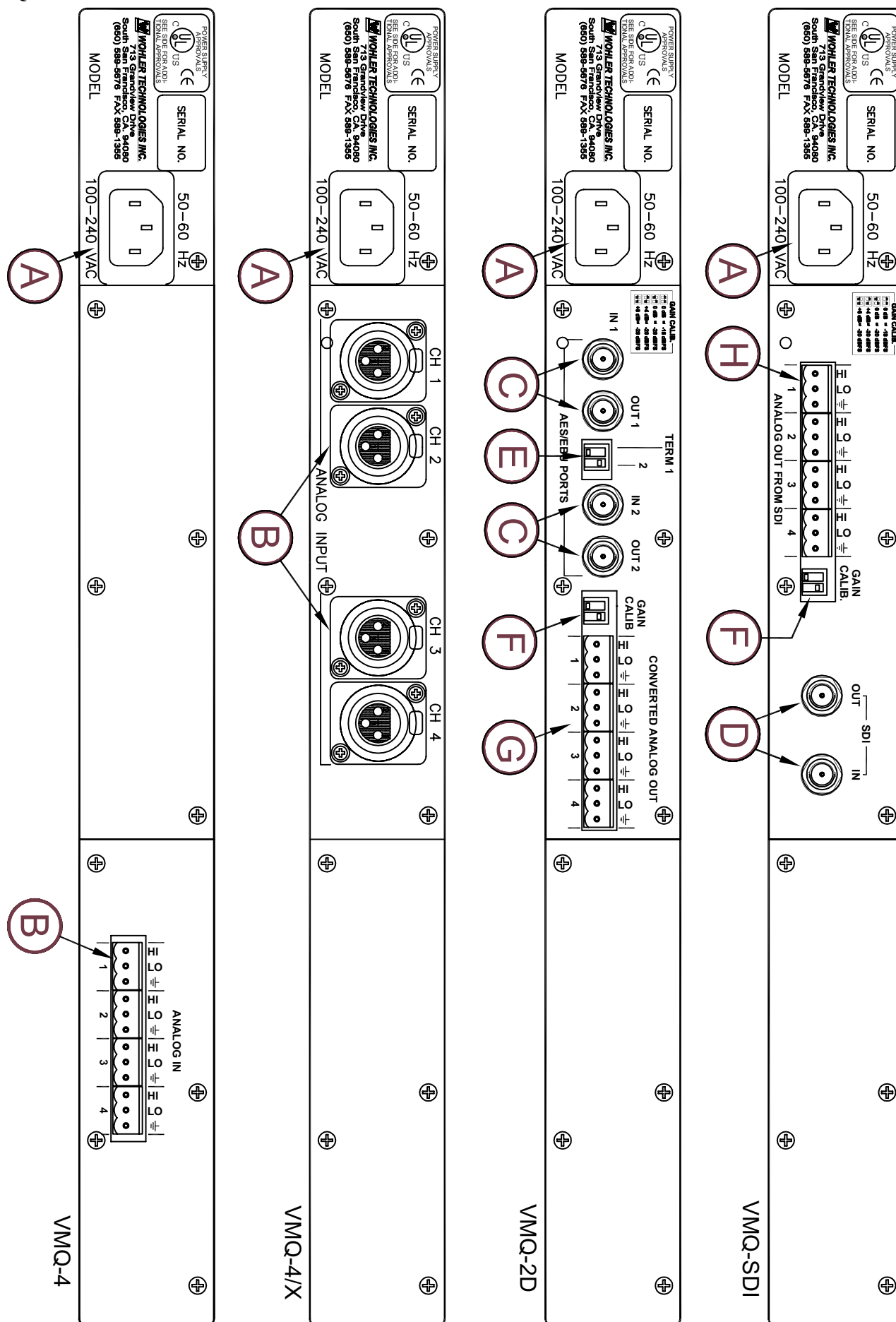


Figure-2b: VMQ Series Rear Panel Features

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Section 3

Technical Information

General Mechanical Observations
Main Audio PCB - General Ciurcuit Description
VMQ-4 System Block Diagram
VMQ-2D System Block Diagram
VMQ-SDI System Block Diagram

NOTE:

PCB layout and schematic support documentation is available upon request.

General Mechanical Observations

Elimination of cabinet and component sympathetic vibrations (resonances) requires considerable attention to mechanical details. Because of this, and the severe physical constraints of the speaker's acoustic enclosures, seemingly minor changes to any of the mechanical details of the unit will frequently seriously impair its acoustic performance. If mechanical work on the unit is absolutely necessary, be sure to make adequate notes to permit accurate reassembly. Unfortunately, the unusual and wholly proprietary method of magnetic shielding is usually degraded somewhat by ANY disassembly of the unit, except removal of the rear panel. The fuse for channels 1 and 2 is located along the back edge of the main circuit board near the power jack; it may be replaced by removing only the rear panel. Almost any other maintenance or repair will require removal of the cover.

Audio Circuit Description

Input Section

The balanced input is buffered by a differential input of the audio signal to dual op amp ICs 1 and 2. The output of ICs 1 and 2 goes to the input of the quad VCA (U7) after receiving a slight treble boost. The output also goes to a quad, high-gain rectifier (IC8), used to drive the LED activity indicators, which indicate the presence of an input signal in each channel.

Volume Controls

Volume controls are implemented through a quad VCA chip (U7). The control potentiometer for each VCA is buffered by IC4 and IC5. Section A and B of the dual IC each buffer one volume control and an associated mute switch. Clockwise rotation of the volume pot decreases the wiper voltage causing the IC4/5 output to rise, which decreases the audio level of the VCA. The mute switch performs this function instantly by taking the IC4/5 inverting input directly to ground.

Limiting Circuitry

The output of the four VCA's are summed into IC6 and IC7 where the audio waveform's conversion to voltage takes place, and the rectified output from each of these stages is the input to a corresponding non-inverting section of IC4 and IC5. These non-inverting sections develop limiting control voltages for each VCA section. A voltage above 2 volts across D17, D18, D19, and D20 will cause a lower gain in the corresponding section of the VCA.

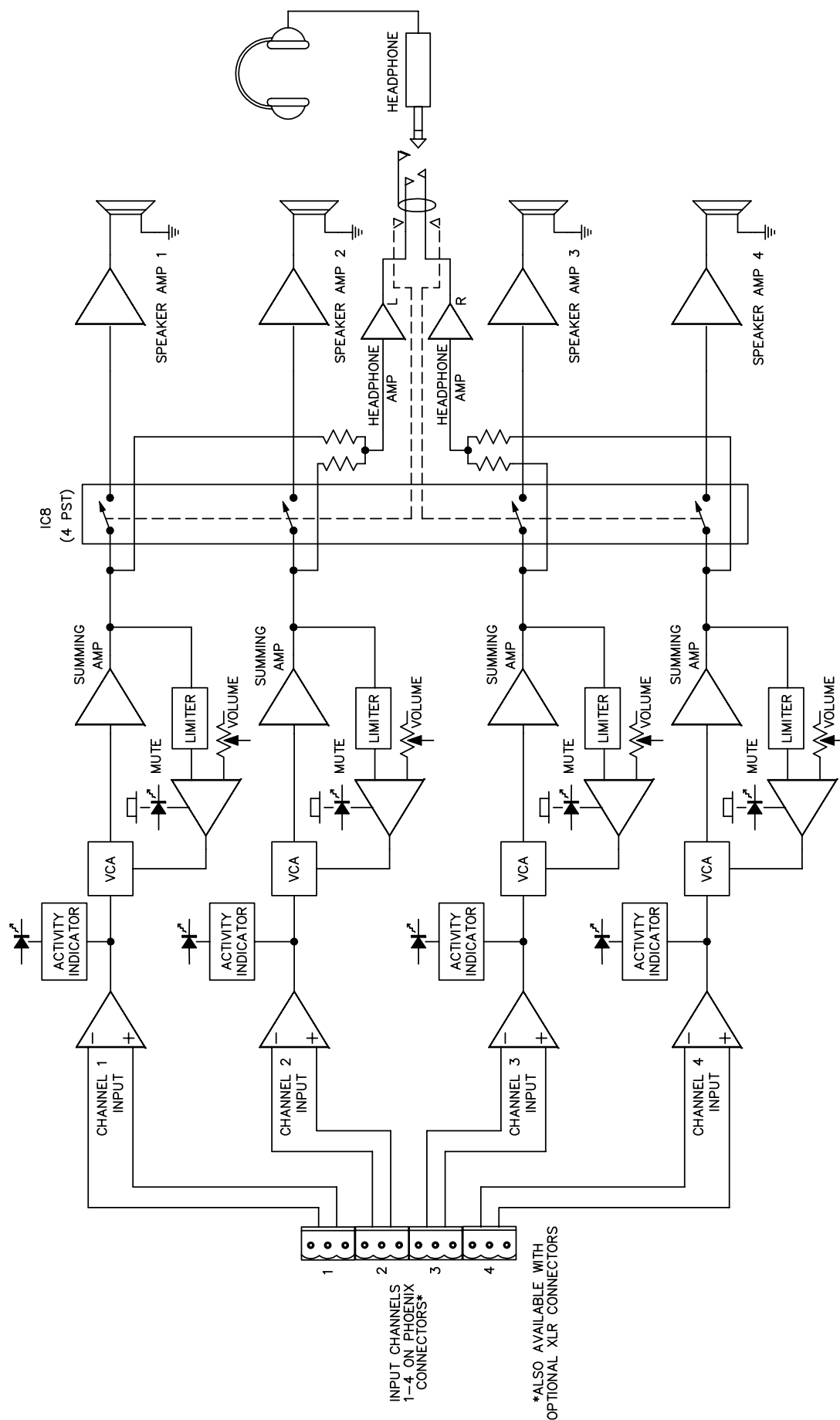
Headphone

The output of the four VCA's (IC6 and IC7) is also the input circuitry for the headphone amplifier as well as the input of the speaker amplifiers, through IC8. The signal passes through U8, a quad CMOS switch. The control input is normally high (above 10 volts) on its way to the speaker amplifier; as well as going to the summing resistor pack SP17, and capacitors C97 and C98 for use with an optional woofer. Channels 1 and 2, which are the outputs of IC6, A and B, are also summed to the input of IC9, which drives the left headphone channel output. IC7, A and B, is summed to the input of IC10 for the right headphone channel. Jumping JP13 will cause all signals to be summed to both amplifiers, thus causing the entire signal to become monaural in the headset.

Headphone Output/Speaker Muting

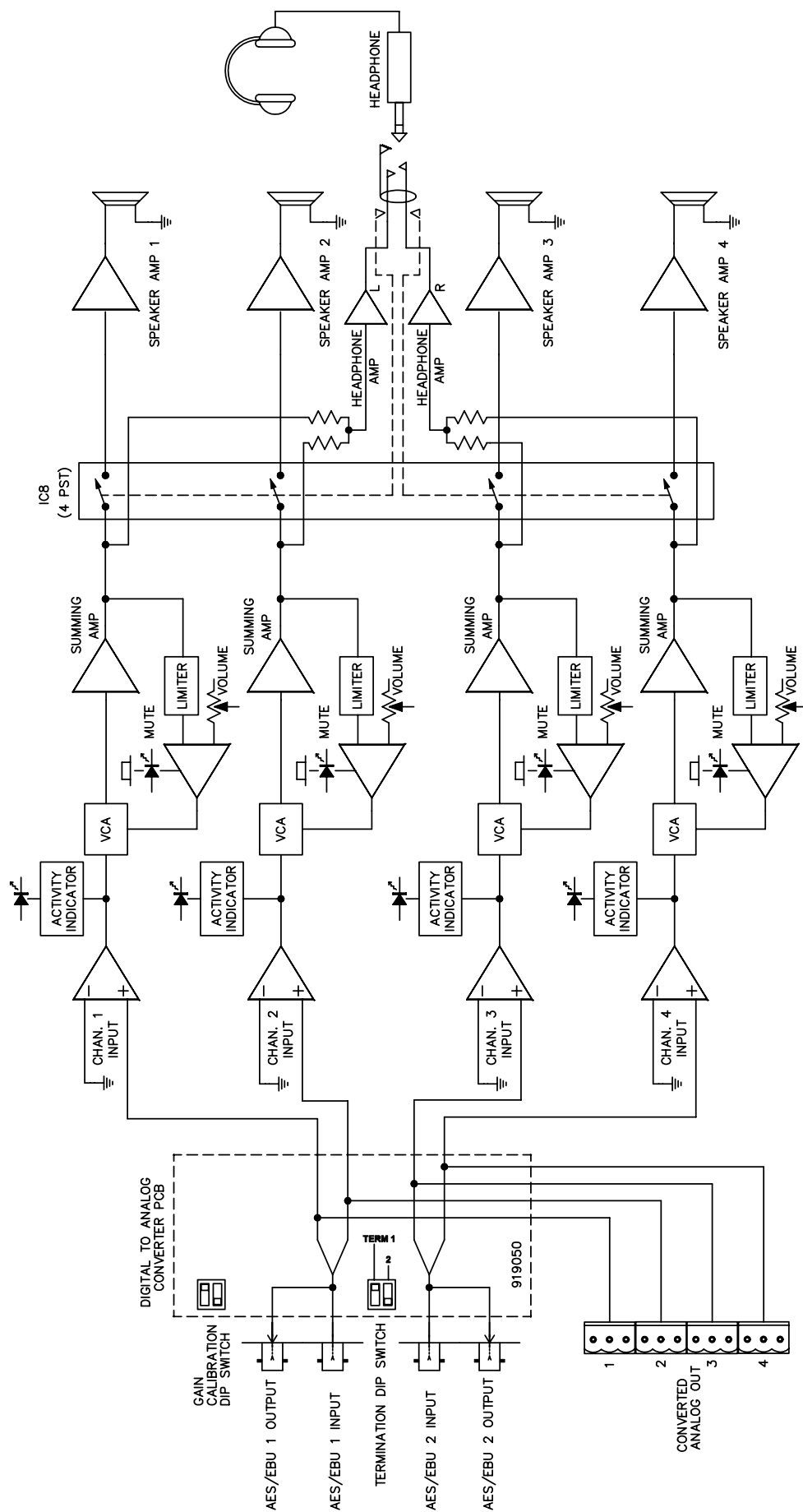
While headphones are not plugged in, the output terminals are open circuit and the op amp DC bias supplied by R7 and R8 keeps pins 2 and 3 of H1 high. Plugging headphones in provides a shunt path to ground for this DC bias through the headphones, which turns off transistors Q1 and Q2. This sets pins 9, 10, and 11 on analog switch U8 high, which switches the signals that normally go to the speaker amps to AC ground (bias) instead. The RC networks of C9 and C10/R9-R11 filter any high-level low frequency transients, which might otherwise affect Q1 and Q2. Note that for this sensing circuit to work, the headphones MUST have a DC resistance not greater than about 1K ohm.

VMQ-4 - System Block Diagram



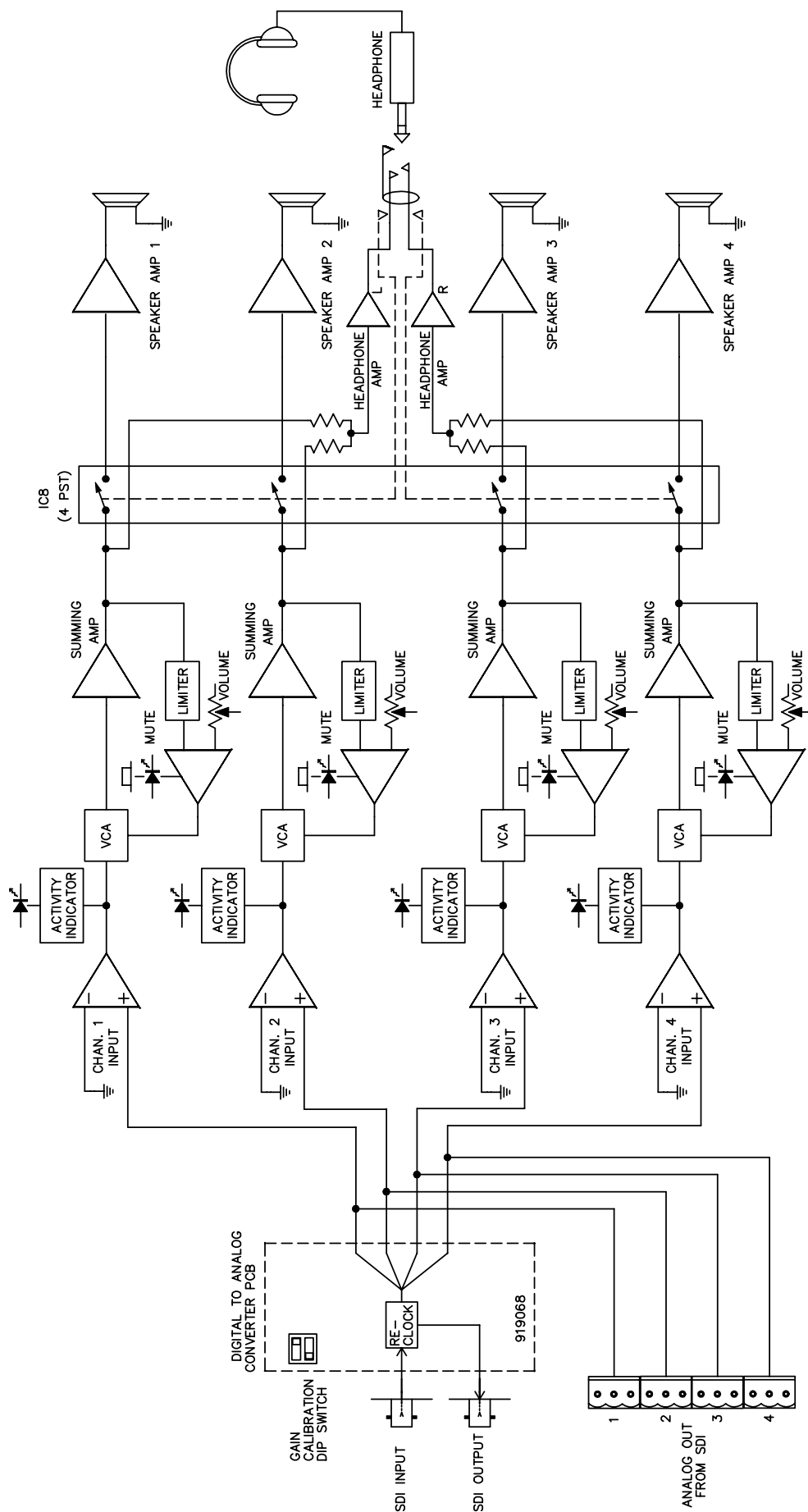
VMQ-4 Block Diagram

VMQ-2D - System Block Diagram



VMQ-2D Block Diagram

VMQ-SDI - System Block Diagram



VMQ-SDI Block Diagram



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